

REMARKS

Claims 1-12 have been amended. New claims 13-20 have been added. Reexamination and reconsideration are respectfully requested.

In the Office Action, claims 1, 3, 4 and 8 were rejected as being anticipated by MAUGHAN et al. (US 4,754,147). Additionally, claims 2, 5-7 and 9-12 were rejected as obvious over MAUGHAN et al. in view of PASTYR et al. (US 4,794,629). Applicants respectfully traverse these rejections in view of the following remarks and clarifying amendments made with respect to claims 1-12.

Applicants' independent claims 1 and 4 have been clarified to note that each of the leaf plate driving bodies 200L, 200R includes one rotating device for engaging with the plurality of leaf plates. A driving force transmitting/cut-off device transmits driving force of the rotating device to the plurality of leaf plates at the same time by engaging the plurality of leaf plates with the rotating device. And, it cuts off the driving force selectively for each leaf plate by disengaging the rotating device.

With Applicants' arrangement as claimed, a driving force of the rotating device is transmitted to the plurality of leaf plates at the same time by engaging the plurality of leaf plates with the rotating device. Thus, the leaf plates are moved together. Further, each of the leaf plates is selectively cut-off from the driving force of the rotating device by disengaging with the rotating device. Hence, each leaf plate can stop moving independently upon reaching a predetermined position. As a result, a predetermined irradiation field can be formed in a much shorter time than in prior known designs which utilize

performed so-called "shaping members" designed to match a desired irradiation field.

By contrast to Applicants' invention as recited in independent claims 1 and 4, MAUGHAN merely describes the known prior art which utilizes shaping members 24, 24a having preformed surfaces 24b, 24c that engage against opposite ends of rods 16 (col. 3, lines 44-50). As noted in MAUGHAN, the shaping members 24, 24a can be made of polystyrene foam and must be previously shaped such as in a conventional, poured-collimator forming system so that the surfaces 24b, 24c match projected surfaces between the cyclotron and the tumor in a patient (col.3, line 66 - col.4, line 6). One way of preparing MAUGHAN's shaping members is to cut the polystyrene foam by moving a hot wire device around a contour on an X-ray film (col. 4, lines 6-14).

In MAUGHAN, a shaping member must be installed into a support plate 11, which is rotated about the ends of the rods to rod 16 to allow gravity to displace the rods against the predetermined surface of the shaping member. At that point, the rods are clamped into position via clamps 20. Accordingly, MAUGHAN's shaping members must be changed every time an irradiation field is to be changed in order to form a beam pass area having a predetermined shape between the parallel rods 16 that face each other. This time consuming and disadvantageous operation is eliminated in Applicants' invention.

Accordingly, Applicants submit independent claims 1 and 4, along with dependent claims 3 and 8 are patentable over MAUGHAN. Further, Applicants have added new claims 13, 15, 16 and 18 which likewise recite the one rotating device for each of the leaf plate driving bodies that engages with the plurality of

leaf plates, as well as cutting-off the driving force selectively for each leaf plate by disengaging a selected one of the plurality of leaf plates with the rotating device. Hence, these claims are also submitted to be patentable for the reasons set forth above.

Regarding Applicants' independent claims 2, 5, 6 and 7, a multi-leaf collimator and medical system are, respectively, claimed and recite each of the leaf plate driving bodies comprising one rotating device for transmitting driving force to the plurality of leaf plates at the same time by engaging with the plurality of leaf plates. Also, a plurality of engaging/disengaging devices are provided in a one-to-one relation to the plurality of leaf plates for selectively engaging and disengaging a corresponding leaf plate with and from the rotating device.

By contrast, as noted above, MAUGHAN operates on the principle of using preformed shaping members having previously defined surfaces in order to form the irradiation field. Hence, MAUGHAN's arrangement of moving parallel rods 16 through the use of shaping members 24, 24a never discloses or suggests the features recited in Applicants' independent claims 2 and 5-7, wherein each of the leaf plate driving bodies comprises one rotating device for transmitting driving force to the plurality of leaf plates at the same time by engaging with the plurality of leaf plates, and a plurality of engaging/disengaging devices provided in a one-to-one relation to the plurality of leaf plates for selectively engaging and disengaging a corresponding leaf plate with and from the rotating device.

Nor are the deficiencies in MAUGHAN remedied by PASTYR. As an initial matter, Applicants point out that PASTYR operates upon the principle of

frame movement and rotation of gearwheels in order to displace the diaphragm plates to shape the irradiation field. Hence, because the two references, MAUGHAN and PASTYR, operate upon completely independent principles, as a *prima facie* matter, Applicants respectfully submit a case of obviousness has not been made as one skilled in the art would have no reason to combine these references, let alone in the manner indicated in the Office Action. Accordingly, because a *prima facie* case of obviousness has not been made, Applicants submit independent claims 2 and 5-7, along with dependent claims 9-12 are patentable over MAUGHAN in view of PASTYR.

Nevertheless, Applicants point out that in PASTYR, bundles of diaphragm plates (36, 38) and (36', 38') are arranged face to face. Each have a movement mechanism that includes a gearwheel 50 attached to an adjustment shaft 51 coupled with a motor 52 through a coupling. A gearwheel 64 is attached to an adjustment shaft 65 coupled with the motor 66 also through a coupling. The adjustment shaft 51 shares a common axis with adjustment shaft 65.

A frame 60 includes toothed shafts 54 and 56, sleeve-shaped connecting part 57, to the shaft 62, lateral arms 71, 72, and guide rods 73 and 74. The adjustment shaft 51 and adjustment shaft 65 are arranged at a space inside the toothed shafts 54, 56, 62. The sleeve-shaped connecting part 57 surrounds the toothed shafts. The lateral arm 72 is attached to an end portion of the toothed shaft 62, and the lateral arm 71 is attached to an end portion of the toothed shaft 54. The guide rods 73, 74 are attached to the lateral arms 71, 72.

The frame 60 is moved along a direction across the diaphragm plates 36 and 38 by means of the motor 75 and the adjustment spindle 76 together with

the motor 52, adjustment shaft 51, gearwheel 50, motor 66, adjustment shaft 65 and gearwheel 64 (col. 8, lines 12-14 and 35-40).

The toothed shafts 54, 56 and 62 are pressed by a contact pressure member 81 provided at a contact pressure bow 83 such that the gear wheels 50 and 64 contact with a toothed 43 of the diaphragm plates 36, 38 (see Fig. 7).

The step of forming a beam pass area (see Fig. 8) suitable for shaping a predetermined irradiation field between the diaphragm plates is described in col. 9, lines 19-41. Namely, the frame 60 is moved along a Y direction (a direction across the diaphragm plates 36, 38), thus the gearwheel 50 or 64 contacts with the toothed 43 of the diaphragm plate 36 or 38 to be moved. In this condition, the gearwheel 50 or 64 is rotated by driving the motor 52 or 66, whereby the diaphragm plate 36 or 38 is moved to a predetermined position. The above-mentioned operation is repeated, and hence the diaphragm plates are moved to a position where a predetermined beam pass area is formed.

As noted above, PASTYR thus has a plurality of rotating devices for engaging with diaphragm plates. The rotating devices are moved along a direction across the plurality of diaphragm plates, thereby an engagement/disengagement of the rotating devices with/from the diaphragm plates is practical. On the contrary, Applicants' invention, as recited in independent claims 2 and 5-7, comprises one rotating device for transmitting driving force to the plurality of leaf plates at the same time by engaging with the plurality of leaf plates. And, Applicants claimed a plurality of engaging/disengaging devices provided in a one-to-one relation to the plurality of leaf plates for selectively engaging and disengaging a corresponding leaf plate

with/from the rotating device. Such an operation is clearly different from PASTYR's multi-leaf collimator. PASTYR does not disclose one rotating device engaging the leaf plates at the same time, nor a plurality of engaging/disengaging devices providing the one-to-one relation for selectively engaging and disengaging corresponding leaf plates from the rotating device.

In view of the above, Applicants submit independent claims 2 and 5-7 are patentable over MAUGHAN in view PASTYR. Further, dependent claims 9-12 are also submitted to be patentable.

Finally, Applicants have added new independent claims 14 and 17, along with dependent claims 19 and 20, which likewise recite the one rotating device for moving the plurality of leaf plates together along one direction by engaging with the plurality of leaf plates, as well as the plurality of engaging/disengaging device provided in a one-to-one relation to the leaf plates for selectively engaging and disengaging a corresponding leaf plate. Hence, Applicants submit these claims are also patentable over MAUGHAN in view of PASTYR.

For the foregoing reasons, Applicants submit claims 1-20 are now in condition for allowance. An early notice to that effect is solicited.

Summarizing, Applicants have made an important contribution to the art to which the present subject matter pertains, for which no counterpart is shown in any of the art or combination of same. The invention is fully set forth and carefully delimited in all claims in this case. Under the patent statute, Applicants should not be deprived of the protection to which they are entitled for this contribution. Accordingly, it is respectfully requested that favorable


reconsideration and an early notice of allowance be provided for all remaining claims.

If there are any questions regarding this amendment or the application in general, a telephone call to the undersigned would be appreciated since this should expedite the prosecution of the application for all concerned.

If necessary to effect a timely response, this paper should be considered as a petition for an Extension of Time sufficient to effect a timely response, and please charge any deficiency in fees or credit any overpayments to Deposit Account No. 05-1323 (Docket #381KA/50339).

Respectfully submitted,

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